SCIENCE

VOL. 91 FRIDAY, MARCH 1, 1940 No. 2357

The Rôle of Refugees in the History of American Science: DR. C. A. BROWNE 203

Obituary:
Jacob Elry Metzger: DR. T. B. SYMONS. *Recent Deaths and Memorials* 208

Scientific Events:
Scientific Collaboration between Great Britain and France; Fellowships for Business Executives of the Massachusetts Institute of Technology; Grants of the Committee on Scientific Research of the American Medical Association; Monographs of the Iron Alloys Committee of the Engineering Foundation; The Cincinnati Meeting of the American Chemical Society 209

Scientific Notes and News 212

Discussion:
Copyright: DR. WALDO G. LELAND. *Types of Animal Reflexes:* PROFESSOR G. H. PARKER. *New Mathematical Library of the Institute for Advanced Study:* PROFESSOR HERMANN WEYL. *Record of Chemical Progress:* PROFESSOR NEIL E. GORDON 215

Scientific Books:
English Diet: PROFESSOR JOHN R. MURLIN. *Antoni van Leeuwenhoek:* PROFESSOR CHARLES A. KOFOID 217

Reports:
Membership of the American Association for the Advancement of Science: DR. F. R. MOULTON 219

Special Articles:
Histamine Release from Blood Cells in Anaphylaxis in Vitro: DR. GERHARD KATZ. *Potassium Deficiency in Ammonium- and Nitrate-fed Tomato Plants:* M. E. WALL and DR. V. A. TIEDJENS. *Polyploidy in Soybean, Pea, Wheat and Rice, Induced by Colchicine Treatment:* DRS. P. S. TANG and W. S. LOO 221

Scientific Apparatus and Laboratory Methods:
A Modified Kendall Tube for Purifying Nitrogen: DR. G. M. SAVAGE and Z. JOHN ORDAL. *Cold Extraction Apparatus:* JOSEPH BENOTTI 222

Science News 10

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal

Lancaster, Pa. Garrison, N. Y.

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington, D. C.

THE ROLE OF REFUGEES IN THE HISTORY OF AMERICAN SCIENCE[1]

By Dr. C. A. BROWNE

U. S. DEPARTMENT OF AGRICULTURE

SINCE the time of the earliest settlements the flight of refugees from Europe has been a most potent factor in the development of American science. These migrations, which resulted from religious persecution, desire to escape imprisonment or military service, curtailment of political liberties, longing for a more congenial social environment and other causes, have come generally in successive waves of disturbance in which all sorts and conditions of men were affected. While the families of peasants and workmen were chiefly involved in these movements, merchants, physicians, scholars, artists and other groups were also concerned.

[1] The biographical notes on the refugee scientists mentioned in the present sketch were culled from various biographical cyclopedias. The new Dictionary of American Biography with its classified index of celebrities according to occupation and place of birth was found to be especially helpful.

The list of European men of science, who from time to time have sought in America refuge from persecution, is a long one and the stories of their adventurous careers would fill a volume of considerable size. In the present paper a few typical illustrations will be cited from the list of scientists who fled to America in the disturbances of the seventeenth, eighteenth and nineteenth centuries.

The earliest conspicuous example of an American refugee scientist is that of John Winthrop, Jr. (1606–1676), who in 1631, because of the persecution of the Puritans in England under Archbishop Laud, joined his father and other coreligionists in the founding of the Bay Colony in New England. "Laud's hand fell heavily on the English Puritans," writes J. R. Green, the eminent English historian. "Thousands of the best scholars, merchants, lawyers, farmers, were flying

over the Atlantic to seek freedom and purity of religion in the wilderness." The later preeminence of the New England colonies in education, science, literature and industry was one result of this migration, and no one was more instrumental than the younger Winthrop in helping to lay the foundations of this leadership. His scientific work as chemist, prospector, physician and manufacturer of iron, salt, saltpeter and other commodities was of great benefit to the New England colonies. He was the first to take up in a serious scientific manner the exploitation of America's natural resources. He equipped the first chemical laboratory in the English colonies, and his library contained the largest colonial collection of scientific works in the seventeenth century. A considerable fragment[2] of this library is still extant, and the breadth of Winthrop's scientific interests is indicated by the fact that of his remaining books 52 volumes relate to chemistry or alchemy, 33 to medicine, 10 to physics, 9 to astronomy, 8 to mathematics and geometry, 8 to natural history, 3 to navigation and a dozen or more scattered volumes to geography, metallurgy, military science, agriculture and political economy. Winthrop was one of the early members of the Royal Society and his papers and reports before this body are the earliest contributions presented by an American before a scientific association. His scientific correspondents, of whom many documents remain, included Boyle, Glauber, Helmont, Keffler, Oldenburg, Moray, Digby and many other celebrities. Subjects referred to in this correspondence cover nearly the entire range of seventeenth century science.

If Winthrop be taken as a type of refugee scientist of the seventeenth century, Joseph Priestley (1733–1804) may be cited as an outstanding example of the scientific men who fled to America to escape persecution in the eighteenth century. Priestley's outspoken sympathy with the development of liberal politics in France provoked the anger of many Englishmen, and this feeling came to a crisis on July 14, 1791 (just as the second anniversary of the fall of the Bastille was about to be celebrated) when a mob in Birmingham burned his chapel, sacked his house and destroyed his laboratory and manuscripts—the labor of years of scientific research. The discrimination in England against Priestley after this outbreak caused him to emigrate to America in 1794 and to join his sons in the founding of a settlement at Northumberland, Pa., where he spent the remainder of his days. Although Priestley made few discoveries of chemical importance after settling in Northumberland, his scientific and political opinions had a pronounced influence on the development of liberal thought in America in the early nineteenth century. Priestley, however, was too old at the time of his exile to adapt himself readily to American conditions, with some phases of which he was not entirely sympathetic. He was never naturalized, and his disinclination to become a citizen of the United States was a trait peculiar to a number of other refugee scientists who came to America in later life. Priestley's name, however, will always be venerated in America, and his well-preserved home in Northumberland, where many pieces of his scientific apparatus are displayed, is visited annually by hundreds from every state in the Union.

It is in the nineteenth century that the greatest exodus of scientific men from Europe to America took place. Following the French Revolution and the Napoleonic Wars a great liberalizing movement began which gave rise to political uprisings in many of the countries of Europe. The attempts to crush these outbreaks led to persecutions that resulted in the emigration of hundreds of thousands of people from Europe to the United States. A few cases will be cited of exiled scientists who participated in the uprisings in Ireland and Germany which, fluctuating in varying intensity for half a century, reached their culmination in 1848.

One of the first of the Irish refugee scientists was William James Macneven (1763–1841). He was educated in the best schools of Europe and obtained his medical degree at Vienna in 1785. Returning to Ireland, he took up the practice of medicine in Dublin, where he also became active in founding the Order of United Irishmen. He was arrested and imprisoned in 1798 for sedition but was released under banishment in 1802. On July 4, 1805, he landed in New York, where he began the practice of medicine. In 1806 he received the honorary degree of M.D. from Columbia College and the following year began lecturing at the New York College of Physicians and Surgeons, where he was made professor of chemistry in 1810. As a chemist Macneven is best known for his early recognition of the importance of the atomic theory. He published an American edition of Brande's "Manual of Chemistry," and was the author of various papers on the chemical examination of waters and minerals. Macneven was a public-spirited citizen and in 1824 was active in helping to found the New York Atheneum, before which he lectured on applied chemistry. A tall shaft to his memory in St. Paul's churchyard on lower Broadway of New York is passed daily by more people than the monument of any American scientist.

A second Irish refugee scientist was John Patten Emmet (1796–1842), who came to America in 1804 when his father, Thomas Addis Emmet (brother of the Irish patriot Robert Emmet), was banished as a leader of the United Irishmen party. Emmet obtained

[2] Owned by the Society Library of New York City.

his medical and chemical training in New York under Dr. W. J. Macneven, and in 1825 was appointed professor of natural philosophy in the newly established University of Virginia. His title was changed in 1827 to that of professor of chemistry and materia medica. He was an ingenious experimenter and invented apparatus for the study of magnetism and electricity.

A third Irish refugee physician and chemist was Thomas Antisell (1817–1893), who obtained his medical degree at the Royal College of Surgeons in London in 1839. He continued his chemical studies on the continent under Pelouze, Biot, Dumas and Berzelius, and then returning to Dublin took up the practice of medicine. Becoming involved in the activities of the "Young Ireland Party" Antisell was sentenced to imprisonment but avoided this penalty by escaping to America as surgeon on an outgoing vessel. He landed in November, 1848, in New York, where he practiced as a physician, gave lectures at medical schools and quickly became interested in the civic affairs of his new home. His career as traveling student, doctor, chemist, Irish political agitator and patriotic citizen of the United States runs in grooves almost parallel with those of his fellow countryman Macneven of a generation before. Antisell dropped his medical practice in 1854 to become geologist for the Pacific Railroad survey. In 1856 he became an examiner in the U. S. Patent Office but resigned this position on the outbreak of the Civil War to devote his energies as physician and surgeon to the care of sick and wounded soldiers. At the conclusion of the war he was mustered out of service with the rank of lieutenant colonel. From 1866 to 1870 Antisell rendered distinguished service as chemist of the U. S. Department of Agriculture, after which he served until 1877 as technologist of a commission appointed by the Japanese Government for improving the agriculture of that nation. He then returned to his old position in Washington as patent examiner, in which he served until retirement. Antisell was the author of several scientific works. He published in 1852 a "Cyclopedia of the Useful Arts" (a 690-page illustrated handbook of progress and invention in different branches of applied science) and in 1859 a book on the "Manufacture of Photogenic and Hydrocarbon Oils from Coal." He was the most versatile of the three Irish refugee scientists that have been named.

Further consideration of English and Irish refugee scientists must be omitted in order to consider briefly several exiles of German origin, who as a class have contributed more to the upbuilding of science, agriculture and industry in the United States than the expatriates of any other nation. Movements of Mennonites, Moravians and other persecuted religious sects from Germany to Pennsylvania began in the early eighteenth century. These exiles were largely of peasant origin, and not many who could be called scientists were found among their number. A few, however, as Christopher Sower (1693–1758), the printer, and David Tanneberger (1728–1804), the organ builder, were skilled craftsmen and contributed much to the cultural development of the Pennsylvania-German settlements.

A very different type of refugee migration from Germany occurred a century later as a result of the liberalizing movement that was promoted by the reaction against the imperialistic policies of Napoleon. This movement after the downfall of Bonaparte was directed against the infraction of popular liberties by the rulers of Prussia, Bavaria, Hanover and other German kingdoms. An outstanding incident of this development was the protest in 1837 of seven professors of the University of Göttingen—the famous "Göttinger Sieben"—against the tyrannical policies of the King of Hanover. The expulsion of these professors (among whom were the physicist Wilhelm Weber and the two philologists, the brothers Jacob and Wilhelm Grimm) from their positions at the university was a great incentive to the growing demand for a more liberal constitutional form of government in all the German states. While this movement reached its culmination in the unsuccessful revolutions of 1848–49, the exodus of scientists from Germany, because of harsh governmental restrictions, was gathering headway at an earlier date.

George F. List (1789–1846), economist, was banished from Germany because of his liberal political views and came to America in 1825. He was a great advocate of Henry Clay's "American System" of tariff protection for domestic industries. Frederick A. Rauch (1806–1841), educator, psychologist and first president of Marshall College, came to America from Germany as a political refugee in 1831. George Engelmann (1809–1884), botanist, meteorologist and physician, came to St. Louis in 1833 from Germany, where his democratic tendencies had provoked unpleasant opposition. He collected a large herbarium and organized the St. Louis Academy of Sciences in 1856. Ferdinand J. Lindheimer (1801–1879), botanist, came to the United States in 1834, a victim of German political repression. Theodor E. Hilgard (1790–1873), scholar, horticulturist and sociologist, dissatisfied with political conditions in Bavaria, came to America in 1836 with his wife, four sons and five daughters. He became a member of the German colony at Belleville, Ill., where he conducted a farm on scientific principles. Many other German exiles, as F. J. Lindheimer, got their first start in America as members of this colony, who were jokingly called "Latin farmers" because many of them had a greater knowledge of the Latin classics than of agriculture. Hilgard, by his ability as a practical horticulturist, did much to counteract

this term of reproach. He wrote many essays on social and political subjects in which he interpreted the ideals of American democracy to German readers. Hilgard's greatest contributions to scientific developments in the United States, however, were the careers of his two gifted sons. Julius E. Hilgard (1825–1891) became a geodesist and ultimately chief of the U. S. Coast Survey. He was a charter member of the National Academy of Sciences and president of the American Association for the Advancement of Science in 1875. Eugene W. Hilgard (1833–1916) became a geologist and the leading authority of his time in soil science, of which branch of knowledge in many respects he might be called the founder. He occupied a foremost place among the pioneers of American agricultural education and research. Frederick Overman (1803–1852), metallurgist, dissatisfied with the lack of constitutional freedom in Germany, came to the United States in 1842. He anglicized his name and became a loyal citizen of his adopted country. He wrote many works on mineralogy, assaying and metallurgy and became the leading authority in this field in the United States. His productive life was cut short by the accidental inhalation of arsene in his Philadelphia laboratory. His "Treatise on Metallurgy," published after his death, passed through six editions and had a great influence on the development of mineral technology in America.

The German refugee scientists who came to America before 1848, of whom many more could be named, were only forerunners of the great exodus that was to follow. The growing demand for constitutional freedom by university professors, students, writers and leaders of public opinion was taken up in more serious fashion by Carl Schurz, Friedrich Hecker, Gustav Struve, Franz Sigel and other revolutionists whose hastily planned outbreaks in the different German states were speedily crushed in 1848–49 by better trained Government troops. The thousands of participants in these uprisings who escaped capture fled beyond the borders of Germany, the great majority of them, including the leaders above named, finding their way to the United States. They comprised men in all walks of life—educators, physicians, lawyers, scientists, writers, technologists, agriculturists, skilled craftsmen of every description and a goodly number of adventurers. Among them were many of the best-trained intellects of Germany, filled with youthful zeal and enthusiasm for the exercise of their talents in a free land of unlimited opportunities. Their arrival in the United States was most timely, for it was a period of great national expansion. Only a few typical instances can be cited of the large number of forty-eighters and forty-niners who exercised an influence on the development of different branches of pure and applied science in the United States.

Julius Bien (1826–1909), cartographer, came to the United States after participating in the Revolution of '48. He was a skilled lithographer and brought the making of maps for geographical and geological publications to a degree of perfection that had never before been attained. It was said of him that he "did more than any other to create and establish scientific standards in American cartography." Edward Dorsch (1822–1887), physician, botanist, philosopher and poet, was involved in the South German revolution, but escaping capture came to America in 1849. He was a collector of plants and insects and like many other German refugees played a prominent part after his arrival in America in the anti-slavery movement. Rudolf Eickemeyer (1831–1895), inventor, joined the insurgents in the Revolution of '48 and after its collapse came to America, where he arrived in 1850. He took out over 150 patents for inventions in machinery, telephony, dynamo construction, electric lighting and other branches of applied science. His greatest discovery, however, was Charles P. Steinmetz (1865–1923), also a refugee scientist, whom he befriended, took into his service and started on the road of epoch-making research in electrical engineering. Eickemeyer's business was consolidated in 1892 with the General Electric Company. He was an exemplary citizen and took an active part in civic affairs. Henry Flad (1824–1898), engineer and inventor, took part in the Revolution of '48 as captain of a company of army engineers and with the downfall of the liberal movement came to the United States in 1849. Like Schurz, Hecker, Struve, Sigel and thousands of other forty-eighters, he rendered conspicuous service in the Union Army during the Civil War. After the war Flad was assistant engineer to J. B. Eads in the construction of the Mississippi bridge at St. Louis. His numerous inventions related to improvements in water works, hydraulic elevators, air-brakes, cable railways and other technical branches. Frederick A. Genth (1820–1893), the eminent chemist, came to America in the great exodus of '48 with hundreds of other German chemists and technologists, many of whom, while not actual participants in the liberal movement, were carried along in the wake of the migration that followed its downfall. Genth in 1872 became head of the chemical department of the University of Pennsylvania, where he made important contributions to mineral chemistry. He was president of the American Chemical Society in 1880 and held other offices of distinction. Abraham Jacobi (1830–1919), well-known pediatrist, was another participant in the Revolution of '48, for which he suffered imprisonment.

He escaped finally to America, where his work on the diseases of children established his fame as the greatest pediatrist of his time. He was a staunch American, and his love for democracy was so strong that he declined the offer of the chair of pediatrics at the University of Berlin when it was offered him in 1894. John M. Maisch (1831–1893), eminent pharmacist, was forced to leave Germany because of his participation in the Baden Rebellion of 1849. Because of his distinguished work in pharmacy and pharmaceutical chemistry he was made head of the U. S. Army Laboratory in Philadelphia during the Civil War. He was afterwards professor at the Philadelphia College of Pharmacy, in which capacity he became prominent as a teacher, author and editor. Charles T. Mohr (1824–1901), botanist, came of a family eminent in the fields of chemistry and pharmacology. After the collapse of the Revolution of '48 he emigrated to the United States, where he worked in the fields of chemistry and pharmacy. He published nearly a hundred papers on botanical subjects and is best known for his extensive memoir on "Plant Life of Alabama." Charles A. Schott (1826–1901), geodesist, served in the ranks of the revolutionists of '48 but left the same year for the United States. He was connected many years with the U. S. Coast Survey, in which he won recognition in the fields of geodesy and terrestrial magnetism. Joseph Zentmayer (1826–1888), inventor and manufacturer of scientific instruments, was an ardent lover of liberty and took an active part in the Revolution of '48. With the failure of this movement he was forced to leave Germany and came to the United States, where he began the manufacture of microscopes, photographic lenses and other apparatus, the excellence of which led to a wide demand. Zentmayer's shop was for many years a favorite rendezvous of Philadelphia scientists. He was awarded the Elliott Cresson medal of the Franklin Institute in 1874 and was the recipient of other honors.

The mid-century exodus of scientists from Germany continued with diminishing intensity from 1854 to the outbreak of the Civil War, but not all those who emigrated to the United States remained. The aspirations of many were not realized, and the subsidence of political repressions in Germany induced some of the more dissatisfied refugees to return. An interesting case of a German scientist who could not accommodate himself to American ways is that of Johannes Wislicenus (1835–1902), whose father because of religious and political persecutions left Germany with his family in 1853. They lived for a time in Boston, where Johannes worked for three months as assistant in the chemical laboratory of Professor E. N. Horsford at Harvard. The family then moved to New York, where the young chemist had a teaching position at the Mechanics Institute. But American life was unpleasant for the homesick youth. The culture of the new country, with the slavery question to the front, seemed crude, and in 1856 the discontented family recrossed the Atlantic and settled in Switzerland. It was only a few years after his return to Europe that Wislicenus achieved international fame for his work in organic chemistry. His experience as a refugee demonstrated that some scientists, like some trees, do not withstand easily the rigors of transplanting.

The names of the eminent refugees just cited represent only a very incomplete cross-section of the different classes of scientific men who came to America as a result of the political disturbances in Germany in the mid-nineteenth century. Many other names could be mentioned. Moreover, the scientists who find places in biographical dictionaries form only a very small percentage of our total scientific population. To gain a truer picture of the cultural and material benefits gained by the United States, as a result of the 1840–1860 immigration of scientists and technologists, the acquisitions just enumerated would have to be increased at least a thousand fold. This, however, is not made the basis of a plea for the unrestricted reception of European scientists by the United States at the present time. Conditions now are vastly different from those existing ninety years ago. The frontiers now have all been occupied and openings for employment are so few that immigration, once unchecked, has had to be curtailed. The advantages of scientific and technological superiority, once held by the Europeans, no longer exist and foreigners have not the opportunities to make themselves useful that were enjoyed by refugees two and three generations ago. A detailed statistical study of the race, age, occupation, religion and other available data pertaining to refugees who fled to America in previous migrations, with brief accounts of their successes and failures, would no doubt help clarify certain problems concerning the large number of exiles who have been banished from Germany since the adoption of the present national socialistic system.

Our survey of the past shows that the German refugees who came to America in the 1840–1860 period merged with the predominant population of the United States with far greater facility than was the case with some immigrants of a different racial type. Thoughtful men of the '48 and '49 migrations saw the need of amalgamating quickly with the life of the new country, while imparting at the same time a leaven of their own inherited culture. This work of readjustment was much more difficult for refugees who had passed middle age. Venturesome men in their twenties and early thirties proved to be the ones who were most readily assimilated in the operations of the great American melting pot.

That Germany should now repeat on a vastly greater

scale the tyrannical follies of a century ago seems too incredible for belief. Now as before she has impoverished her own intellectual and spiritual resources with the corresponding enrichment of other countries.

According to an editorial statement in *The New York Times* of August 13, 1939, "all told, about 1,700 eminent professors of science and philosophy have been forced to leave Germany and begin life anew in other countries. These 1,700 are the victims of cruelty and blindness unprecedented in the history of thought." It is hoped that in spite of this persecution there still burns in the breasts of German scientists and scholars a goodly portion of the flaming reaction against tyranny that fired the hearts a century ago of the famous "Göttinger Sieben" and of the thousands of noble youths who, although losing their battle at home for intellectual freedom, found what they desired in another land. In view of what these exiles accomplished it can truthfully be said—"They builded better than they knew."

OBITUARY

JACOB ELRY METZGER

JACOB ELRY METZGER, director of the Maryland Agricultural Experiment Station, died of coronary thrombosis on December 25, 1939, at the Good Samaritan Hospital in West Palm Beach, Florida.

Although he had been in poor health for about a month, his condition was not considered serious. However, he decided to spend a month in rest and vacation and on December 19, accompanied by Mrs. Metzger, left for Lake Worth, Florida. Almost immediately upon arrival his condition became so serious that he was taken to the hospital, where death came early on Christmas morning.

Director Metzger was born on a farm near New Enterprise, Bedford County, Pennsylvania, on July 30, 1882. His early scholastic training was secured in the public and normal schools of his home county and in the preparatory department of the Pennsylvania State College. He received the degree of bachelor of science from the latter institution in 1911, and in 1924 was granted the master of arts degree by Johns Hopkins University.

Director Metzger began his career as an educator prior to entering college, when he was a teacher and principal in the public schools of his home county. For a number of years after graduation, his activities were associated with the public schools. Starting with the organization of the agricultural work in the high school at Fergus Falls, Minnesota, he remained in charge of that work until 1914, when he joined the faculty of the Maryland Agricultural College, now the University of Maryland. His first work at that institution was to organize a department of agricultural education and the summer school, of which he was the director for four years. During the same period, he served as supervisor of agriculture in the high schools of Maryland under the State Department of Education.

In 1917, Director Metzger became identified exclusively with the teaching and research of the University of Maryland. At that time he was made head of the department of agronomy and agronomist in the Agricultural Experiment Station, which positions he held until his death. Other positions held by him later included: acting dean of the College of Agriculture during the absence of the dean in 1924–25; assistant director of the Agricultural Experiment Station 1929-37; acting director from 1937 until he was made director in 1939.

During the years of his connection with the University of Maryland, he represented the institution and state in many national capacities, such as membership on the Corn Judging Committee of the International Grain and Hay Show, and as a representative of the United States at the One-Hundredth Anniversary of Natural Nitrates, held at Santiago, Chile, in 1930.

Director Metzger was a fellow of the American Association for the Advancement of Science, and a member of the American Society of Agronomy and of the Academy of Political and Social Sciences. He held membership in the Sigma Phi Sigma social fraternity, and in Phi Kappa Phi, Sigma Xi and Gamma Sigma Delta, honorary fraternities. He was a past president of the Prince George's County Kiwanis Club and a member of Mt. Hermon Lodge of Masons.

Although Director Metzger's special field of activities was farm crops, his wide general interest in agriculture is evident from the subject matter included in the many bulletins and scientific articles prepared by him and his associates. Probably his greatest contribution to Maryland agriculture resulted from his practical grasp of problems in their various phases and his ability to coordinate the work of different departments in the experiment station in such manner as to secure effective solutions. He was very widely known throughout the state and his counsel was sought at agricultural meetings of all kinds.

In 1912, Director Metzger was married to Jane R. Butts, of New Enterprise, Pa., who survives. In addition to his widow, he is survived by a brother Dr. Irvin D. Metzger, of Pittsburgh, Pa., chairman of the State Medical Board, and three sisters, Mrs. Ira

Kegarise, Mrs. Elry Furry, both of New Enterprise, Pa. and Mrs. Arch Furry, of Johnstown, Pa. Three brothers preceded him in death.

T. B. Symons

Department of Agronomy,
University of Maryland

RECENT DEATHS AND MEMORIALS

Dr. Herbert V. Neal, who retired in 1938 as professor of zoology and dean of the Graduate School of Tufts College, was killed in an automobile accident on February 21. He was seventy years old.

Dr. William Conger Morgan, professor of chemistry and chairman of the department at the University of California at Los Angeles, died on February 9. He was in his sixty-sixth year.

Dr. Horace T. Mann, associate professor of petroleum engineering at the Massachusetts Institute of Technology, died on February 8 in his fifty-ninth year.

Dr. Ulysses S. Hanna, professor emeritus of mathematics at Indiana University, for forty-two years a member of the department, died on February 18 at the age of seventy-five years.

Ernest Albert Howes, dean of the College of Agriculture at the University of Alberta, died on February 10 at the age of sixty-seven years. He was a former member of the Canadian Department of Agriculture in Ottawa and had been professor of agronomy for a year at the University of Nevada.

Dr. Friedrich Emich, professor emeritus of the Polytechnique Institute of Graz, Austria, the originator of modern microchemistry, died on January 22 at the age of seventy-nine years.

Dr. Arvid Gustaf Högbom, professor emeritus of geology at Upsala University, died on January 19, at the age of eighty-four years. He was a correspondent of the Geological Society of America and an honorary member of the geological societies of Vienna and Frankfurt a. Main, and of the Geographical Society of Finland.

A correspondent writes: Notice has just been received from Dr. A. E. Fersman, of Moscow, of the death in Leningrad on October 25, in his eightieth year, of Professor Franz J. Loewinson-Lessing, member of the Academy of Sciences, USSR, and director of its Petrographical Institute, correspondent of the Geological Society of America, honorary member of the Geological Societies of London, Brussels and Liége. Professor Loewinson-Lessing, geological leader of Russian scientific men for many generations, was founder of the Petrographical Institute of the Academy of Sciences, USSR, author of more than two hundred scientific works, and was widely known for his chemical classification of rocks and a series of text-books on geology and petrography.

A portrait of the late Dr. T. Wingate Todd, professor of anatomy at Western Reserve University School of Medicine, Cleveland, was recently presented to the library of the department of anatomy by the Charles Bolton Fund. Birdsill Holly Broadbent, director of the fund, made the presentation on Dr. Todd's birthday, January 15, and President Winfred G. Leutner accepted it. The portrait was painted by Dr. Erich von Baeyer, fellow in röntgenology at University Hospital.

Nature states that in memory of the late Professor V. R. Williams, the Russian authority on soils, the Timiryazev Agricultural Academy in Moscow has founded three annual prizes to be awarded for the best work on soil study and cultivation. The first prize is of 5,000 roubles, the second of 3,000 roubles and the third of 1,500 roubles. The Commissariat of Agriculture is preparing for publication a complete collection of the works of Professor Williams.

SCIENTIFIC EVENTS

SCIENTIFIC COLLABORATION BETWEEN GREAT BRITAIN AND FRANCE

The issue of *Nature* for February 3 gives an account of the visit of French scientific men to Great Britain. It says that there was a delegation from the Centre National de la Recherche Scientifique, the director of which, Professor H. Longchambon, was at the head. The other members of the delegation were: M. M. Fréchet, professor of mathematics at the Sorbonne; M. G. Darmois, professor of mathematics at the Sorbonne; M. F. Joliot, professor of physics at the Sorbonne; M. P. Auger, professor of physical chemistry at the Sorbonne; M. C. Sadron, professor of building legislation at the Ecole Nationale Supérieure des Beaux-Arts, Strasbourg; M. G. Dupont, professor of theoretical chemistry at the Sorbonne; M. Denivelle, professor of chemistry at the Ecole Supérieure de Chimie at Mulhouse; M. A. Mayer, professor of medicine at the Collège de France; M. L. Blaringhem, professor of botany at the Sorbonne; M. P. Chouard, professor of agriculture at the Conservatoire National des Arts et Métiers; M. P. Langevin, professor of experimental physics at the Collège de France; Dr. P. Montel, professor of mathematics at the Sorbonne.

Lord Chatfield spoke recently in the House of Lords on the exchange of information and extension of the

liaison between the scientific organizations of Great Britain and France. The program arranged for the visitors included a reception at the Royal Society on January 29, when the guests were received on its behalf by Sir Albert Seward and Professor F. G. Donnan. Dr. E. V. Appleton then addressed the meeting, and described the organization of the scientific effort for defence in Great Britain. The French delegation was introduced by Dr. Montel, after which Professor Longchambon described the steps taken in France to mobilize scientific research. Professor Langevin also spoke. On January 30, the French delegation visited the National Physical Laboratory at Teddington, and on the following day went to Cambridge, where they visited the Cavendish Laboratory and the Colloid Science Laboratory.

A meeting of the Royal Society was arranged for February 1, at which Sir Arthur Eddington read a paper on "The Masses of the Proton, Neutron and Mesotron," and L. Jánossy and B. Rossi a paper on "Photon Component of Cosmic Radiation." Professor E. J. Williams gave an account of his experiments on the transformation of mesotrons into electrons, and Professor P. Auger and Professor P. M. S. Blackett took part in the discussion. On the same evening the French delegation was entertained at dinner by British men of science.

FELLOWSHIPS FOR BUSINESS EXECUTIVES OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

THE third competition for at least ten fellowships open to young business executives which will cover twelve months of advanced study and investigation in the fields of business administration and economics has been announced by the Massachusetts Institute of Technology.

It is planned that the fellows obtain leave of absence from their present employment in order to undertake a special one-year program of work aimed further to prepare them for positions of higher administrative responsibility. The program, which is under the direction of Professor Wyman B. Fiske, is made possible largely through a renewed grant of $32,500 from the Alfred P. Sloan Foundation. It meets the stated objective of the foundation—"the increase and diffusion of economic knowledge" by emphasis upon the broader economic and social aspects and responsibilities of industry. Stipends of $2,500 for fellows who are married are permitted. This brings the opportunity within the range of all who are competent to benefit from it. The competition will close on March 16.

Opportunity is provided for advanced study in a variety of professional subjects and for concentration in a chosen field in an attempt to give a broad understanding of the implications of each function and of its relation to the rest of the business. Each fellow will be required to undertake an individual investigation into some aspect of business administration. These investigations usually involve field work and ordinarily are in the same field as that selected for concentration.

There will be an organized series of evening conferences with approximately forty leading industrial executives, government representatives and labor leaders. Part of these conferences are held in connection with field trips in which the group combines visits to the industries of a particular location and is given opportunities for conferences with the executives of the plants visited. A wide range of industries and a broad geographic area are represented in the group that cooperates in this activity.

The selection of fellows is made upon the basis not only of certain minimum requirements, but also on evidence of ability and opportunity to benefit from the special nature of the program. Applicants should be between the ages of twenty-seven and thirty-four years and should have had a minimum of five years of industrial experience, part at least of a managerial type and in executive work, following the completion of their academic education. The academic background must have been in either science or engineering.

GRANTS OF THE COMMITTEE ON SCIENTIFIC RESEARCH OF THE AMERICAN MEDICAL ASSOCIATION

THE Committee on Scientific Research of the American Medical Association, under the chairmanship of Dr. Hektoen, has awarded the following grants:

To the Division of Neurology and Neurosurgery of the University of Chicago for the investigations of Drs. P. C. Bucy and Heinrich Klüver on the functions of the temporal lobes of the rhesus monkey, which will be extended by Dr. W. H. Sweet in an anatomical study of the projection from the temporal lobe in that species.

To Dr. A. G. Eaton, assistant professor of physiology at the School of Medicine of the Louisiana State University, for the continuation of his work on the absorption and metabolism of the amino acids.

To Dr. Louis N. Katz, director of cardiovascular research at the Michael Reese Hospital, Chicago, for a study of factors influencing the work of the heart.

To Dr. I. Davidsohn, pathologist of the Mount Sinai Hospital, Chicago, for work on the Thomsen Panagglutination Phenomenon in Serum.

To Dr. Robert S. Dow, of the Medical School of the University of Oregon, for the completion of study of the vascular architect and lesions of multiple sclerosis.

To Dr. Armand J. Quick, of the department of pharma-

cology of the School of Medicine of Marquette University, for a study of the problem of "the conversion of prothrombin to thrombin."

To the Medical School of the University of Minnesota, for an investigation to be made by Joseph T. King on the antagonistic effect of tissues on the action of sulfanilamide.

To Professor Edward S. West, of the Medical School of the University of Oregon, for an investigation of vesical calculi.

MONOGRAPHS OF THE IRON ALLOYS COMMITTEE OF THE ENGINEERING FOUNDATION

As the result of ten years of research by the Iron Alloys Committee of the Engineering Foundation and with the cooperation of eighty-eight manufacturers, research institutes, technical societies and federal bureaus, hitherto inaccessible information has been assembled from the scientific and technical literature of many nations. The cost of the investigation was $271,700.

This work is the first critical review of its kind ever attempted; approximately 10,000 papers have been read, and 20,000 abstracts have been prepared. Out of this mass of material, embracing international progress recorded since 1890, ten monographs containing 5,630 pages have been issued.

Of the 6,218 papers utilized in these publications, the United States contributed 2,708, or 43.5 per cent. Germany was second with 1,578, or 25.5 per cent.; England was third with 1,188, or 19.1 per cent.; France was fourth with 407, or 6.5 per cent., and Japan was fifth with 203, or 3.2 per cent. Sweden is credited with 71, or 1.1 per cent.; Russia with 24, or 0.4 per cent.; Italy with 23, or 0.4 per cent.; the Netherlands with 11, or 0.2 per cent. Five papers, or 0.1 per cent., originated in other countries.

There are nearly 2,000 publications in ten languages which contain frequent or occasional articles on ferrous metallurgy. Of these, approximately 150 contain important reports of metallurgical progress and research. All these journals have been searched completely from 1890 to date and have been abstracted in as much detail as necessary for the preparation of the monographs.

Four additional monographs are planned after the original program of the alloys of iron research is finished early in 1943. The committee recommends that thereafter an annual appropriation of about $15,000 be made so that the monographs may be revised and brought up to date at regular intervals.

The monographs were compiled under the direction of the twelve members of the Iron Alloys Committee, and of metallurgists and representatives of other technical fields. In addition, a large number of research workers supplied unpublished data. They include nearly two hundred Americans, eight Englishmen, seven Germans, two Czechs, two Japanese and two Swedes.

Monographs already available deal with alloys of iron and molybdenum, alloys of iron and silicon, alloys of iron and tungsten, alloys of iron and copper, principles of phase diagrams, the metal—iron, alloys of iron and carbon, alloys of iron and chromium, low-chromium alloys, alloys of iron and nickel, special-purpose alloys and high-chromium alloys.

Professor George B. Waterhouse, of the Massachusetts Institute of Technology, representing the American Institute of Mining and Metallurgical Engineers, is chairman and director of the committee. Other members are:

Lyman J. Briggs, director, National Bureau of Standards, represented by J. G. Thompson, senior metallurgist in the bureau; John W. Finch, director, United States Bureau of Mines, and R. S. Dean, chief engineer, Metallurgical Division, alternate; John Johnston, director of research, United States Steel Corporation, Kearney, N. J., representing the American Iron and Steel Institute; James T. Mackenzie, metallurgist and chief chemist, American Cast Iron Pipe Company, Birmingham, Ala., representing the American Foundrymen's Association; Dean Bradley Stoughton, of Lehigh University, representing the American Society for Metals; Jerome Strauss, vice-president of the Vanadium Corporation of America, Bridgeville, Pa., representing the American Society for Testing Materials; T. H. Wickenden, assistant manager, Development and Research, International Nickel Company, New York, representing the Society of Automotive Engineers; James H. Critchett, vice-president of the Union Carbide and Carbon Research Laboratories, New York, representing the American Electrochemical Society; Wilfred Sykes, director and assistant to the president of the Inland Steel Company, Chicago, member-at-large; Frank T. Sisco, metallurgist and editor; John S. Marsh, physical metallurgist and associate editor.

THE CINCINNATI MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE American Chemical Soicety will meet in Cincinnati from April 2 to 12. With the exception of the Division of Fertilizer Chemistry all divisions plan to present programs, including eight symposia, several of which will be held jointly by two of the divisions.

The programs of the divisions, as reported in *Chemical and Chemical Engineering News,* follow:

The Division of Agricultural and Food Chemistry has organized a Symposium on the Utilization of Agricultural Wastes, to which two sessions probably will be devoted. The Division of Biological Chemistry is joining in a Symposium on Sterols and Lipoids. Papers on miscellaneous agricultural and food subjects will be offered.

The Division of Biological Chemistry is also joining

with the Division of Medicinal Chemistry in a Symposium on Sulfanilamide and Related Derivatives. Time will be provided for sessions of general papers within the field of the division.

The Division of Cellulose Chemistry and the Division of Paint and Varnish Chemistry are sponsoring jointly a Symposium on Cellulose Plastics. Two sessions will be devoted to general divisional papers.

The Division of Chemical Education is again organizing a student program. In addition, the customary student breakfast will be held. The division will conduct a panel discussion on The Future of Chemistry as a Specialized Science in the High School Curriculum. It also plans two sessions for miscellaneous papers within its field. The usual luncheon will be held.

The Division of Colloid Chemistry will meet for one session of miscellaneous papers.

The Division of Gas and Fuel Chemistry is proposing to continue in Cincinnati the discussion of the papers which formed the Symposium on the Combustion of Solid Fuels given at the Boston meeting. Time will be provided for presentation of papers on miscellaneous subjects relating to fuel chemistry.

The Division of the History of Chemistry plans one session of miscellaneous papers at Cincinnati.

General papers will fill one day's program for the *Division of Industrial and Engineering Chemistry*. Also, it will sponsor a Symposium on Chemistry of Electrical Insulation.

The Division of Medicinal Chemistry, in addition to the joint symposium with the Division of Biological Chemistry, will hold two sessions for the presentation of miscellaneous papers on medicinal chemistry. A divisional luncheon will be held on Wednesday.

The Division of Microchemistry will meet for two sessions of miscellaneous papers.

The Division of Organic Chemistry will offer six sessions of papers.

The Division of Paint and Varnish Chemistry, in addition to a symposium with the Division of Cellulose Chemistry, is arranging for four sessions devoted to papers dealing with organic plastic coatings. Half a day will be taken up by papers presented by members of the Plastics Group.

The Division of Petroleum Chemistry will sponsor a Symposium on Fundamental Chemical Thermodynamics of Hydrocarbons and Their Derivatives under the chairmanship of F. D. Rossini. Time will also be available for other papers within the field of the division. The customary dinner will be held.

The Division of Physical and Inorganic Chemistry has organized symposia on the Application of Mathematics to Chemistry and on Phase Transitions. Sessions will be available for papers on physical, inorganic and analytical chemistry. The division will meet for dinner.

The Division of Rubber Chemistry plans to meet on Thursday and Friday for a program of papers on general subjects pertaining to rubber chemistry and technology.

The Division of Sugar Chemistry and Technology will present a program of miscellaneous papers in two sessions.

The Division of Water, Sewage and Sanitation Chemistry will have three general sessions. An inspection trip and divisional dinner also are scheduled.

SCIENTIFIC NOTES AND NEWS

THE diploma and medal symbolizing the awarding of the Nobel Prize in physics for the year 1939 were presented to Dr. Ernest Orlando Lawrence, head of the Radiation Laboratory of the University of California, on the evening of February 29. The presentation was made by the Hon. Carl Edward Wallerstedt, consul general of Sweden in San Francisco. Dr. Robert Gordon Sproul, president of the University of California, presided, and an address reviewing Dr. Lawrence's work and achievements was made by Dr. Raymond T. Birge, chairman of the department of physics. Dr. Lawrence closed the program with a speech of acceptance. The scroll of achievement as a "modern pioneer of science" of the National Manufacturers Association in recognition of his invention of the cyclotron was presented to Dr. Lawrence on February 23.

THE Leon P. Smith award for "outstanding service as a teacher" was presented to Dr. Stephen L. Taber, head of the department of geology of the University of South Carolina, at a dinner held recently at Wesleyan College, Macon, Ga. The Smith award, consisting of a gold medallion, was established two years ago by the Crucible Club, to be presented annually to the teacher of chemistry or geology "who has, through years of devotion to his chosen profession, exerted a real and significant influence upon the lives and thought of students of the Southeast." The first recipient of the award was Dr. E. Emmet Reid, professor emeritus of chemistry at the Johns Hopkins University, who is now engaged in directing the research work of students at the University of South Carolina and at other Southern institutions.

THE Lamme Medal of the American Institute of Electrical Engineers for 1939 has been awarded to Dr. Norman W. Storer, retired consulting railway engineer of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., "for pioneering development and application of equipment for electrical traction." The medal and certificate will be presented to him at the annual summer convention of the institute, which is to be held in Swampscott, Mass., from June 24 to 28.

THE Carlos Manuel de Cespedes decoration of Cuba, commander grade, was conferred at Havana on Feb-

ruary 17 by President Federico Laredo Bru on Dr. William O. Hotchkiss, president of the Rensselaer Polytechnic Institute.

DR. GEORGE H. HART, professor of animal husbandry of the College of Agriculture of the University of California, was elected president of the American Society for Animal Production at the recent Chicago meeting.

THE Grand Cross of Distinguished Service of the German Eagle was awarded to Sven Anders Hedin, the Swedish explorer and writer, on the occasion of his seventy-fifth birthday on February 18.

THE medal of honor of the Romanian Chemical Society at Bucharest has been conferred on Dr. Wolfgang Ostwald, professor of colloid chemistry at the University of Leipzig.

THE Galvani Medal has been conferred by the University of Munich on Dr. Klaus Clusius, professor of physical chemistry at the university.

AT the mid-year convocation of the University of Pennsylvania on February 17 the degree of doctor of science was conferred on Dr. Henry A. Pilsbry, curator of the department of mollusks at the Academy of Natural Sciences of Philadelphia; the degree of doctor of laws was conferred on William H. Donner, president of the International Cancer Research Foundation; on Conrad N. Lauer, president of the Philadelphia Gas Works Company; on Philip C. Staples, president of the Bell Telephone Company of Pennsylvania, and on Frank P. Graves, Commissioner of Education for the State of New York.

ROBERT R. MCCORMICK, editor and publisher of the Chicago *Tribune*, has given the property at the northwest corner of Lake Shore Drive and Pearson Street to Northwestern University "for the purpose of establishing and maintaining a fund, the income from which is to be spent for research in the medical school." The fund is to be called the "Irving S. Cutter Fund for Medical Research," in honor of the dean of the medical school, who is also health editor of the *Tribune*.

DR. F. S. C. NORTHROP, professor of philosophy and chairman of the department of philosophy at Yale University, has been elected master of Silliman College, a new undergraduate unit to be opened in the autumn.

DR. J. W. MEHL, of the department of physical chemistry of Harvard University, has been appointed assistant professor in the department of biochemistry of the Medical School of the University of Southern California. He succeeds Dr. Joseph S. Butts, who is now professor of biochemistry at Oregon State University, Corvallis.

AT the College of the City of New York, Dr. Albert B. Newman, chairman of the department of chemical engineering, has been appointed acting dean of the School of Technology. Professor William Allan will succeed Professor Frederick Skene as chairman of the department of civil engineering.

IT is stated in *Museum News* that Dr. S. A. Barrett, director of the Milwaukee Public Museum, retired on January 1 and was elected director emeritus. Dr. Barrett had been director for nearly twenty years and a member of the staff for more than thirty years. He plans to continue research and writing at the museum. He will be succeeded as director by Ira Edwards, curator of geology.

DR. HOPE HIBBARD, Oberlin College, zoology; Dr. Thelma Z. Lavine, Radcliffe College, philosophy, and Dr. Ruth Struik, University of Prague, mathematics, have been appointed research fellows at Radcliffe College.

DR. CHARLES N. GOULD, formerly state geologist of Oklahoma, who since 1935 has been connected with the National Park Service in the capacity of regional geologist with headquarters at Santa Fé, N. M., resigned this position on February 1. His future address will be Norman, Okla.

DR. EDWARD A. DOISY, professor of biological chemistry and director of the department of chemistry at the School of Medicine of St. Louis University, has been appointed chairman of the committee on awards for the prize of $1,000 "to encourage investigation in endocrinology," recently established by E. R. Squibb and Son.

EDWARD B. BALLARD, of the National Park Service, has been appointed executive secretary of the National Parks Association.

DR. ROBERT A. MILLIKAN, who during the past three months has been making a study of cosmic rays in India, sailed for the United States from Manila on February 22.

DR. QUENTIN M. GEIMAN, of the department of comparative pathology and tropical medicine of the Schools of Medicine and Public Health of Harvard University, has returned from Peru. While there he organized a department of parasitology in the new National Institute of Hygiene and Public Health in Lima under the direction of Dr. Telemaco Battistini. He also taught medical protozoology in the University of San Marcos and conducted investigations in parasitology.

AT the dinner meeting of the Washington Academy of Medicine on February 29, Dr. Lyman J. Briggs, director of the National Bureau of Standards, made an address entitled "Developments in Modern Physics and Their Relation to Medicine."

DR. DUGALD C. JACKSON, professor emeritus of electrical engineering at the Massachusetts Institute of Technology, gave one of a series of lectures to the seniors in the College of Engineering, University of Notre Dame, on February 10. His address was entitled "The Part Played by Engineering and Architecture in the Development of Civilization."

DR. CHARLES GALTON DARWIN, master of Christ's College, Cambridge, previously Tait professor of natural philosophy at the University of Edinburgh, will deliver on April 25 the thirty-first Kelvin lecture of the British Institution of Electrical Engineers. The lecture will be entitled "Thermodynamics and the Coldest Temperatures."

CLINICS were held at the Duke University School of Medicine and Hospital on January 26, by Dr. Samuel A. Vest, Jr., professor of urology at the Medical School of the University of Virginia, on "Testosterone Therapy in Hypogenitalism"; on February 27 by Dr. John M. T. Finney, Jr., associate in surgery of the School of Medicine of the Johns Hopkins University, on "Appendicitis," and on February 28 by Dr. Thomas Francis, Jr., professor of bacteriology at the College of Medicine of New York University.

DR. OSCAR E. HARDER, assistant director of the Battelle Memorial Institute at Columbus, Ohio, will deliver the fourteenth annual series of Priestley lectures at The Pennsylvania State College from March 11 to 15. The Priestley lectures were established in 1926 by the members of the faculty of the department of chemistry as a memorial to Joseph Priestley. Since 1931 the lectures have been sponsored by the local chapter of Phi Lambda Epsilon, national honorary chemical fraternity, in cooperation with the department of chemistry. Dr. Harder's subject will be "Physical Metallurgy in the Service of Industry."

THE sixth International Congress for Experimental Cytology, which it was planned to hold in Stockholm from July 25 to August 1, has on account of the international situation been postponed until some future date.

THE thirty-ninth annual meeting of the Cordilleran Section of the Geological Society of America will be held at the University of California at Los Angeles on Friday and Saturday, April 12 and 13. Hotel headquarters will be at the Windermere Hotel, Santa Monica. The annual dinner will be held on April 12 at the Miramar Hotel, under the auspices of the Branner Club. A field excursion through the Palos Verdes Hills is planned for Sunday, April 14. Detailed information may be secured from the secretary of the section, Charles A. Anderson, University of California, Berkeley. The Pacific Coast Branch of the Paleontological Society and the Seismological Society of America will meet in conjunction with the section.

THE spring meeting of the American Society for Testing Materials will be held at Detroit on March 6. The program will include a symposium of six special papers on "New Materials in Transportation." The committees of the society meet from March 4 to 8. These committees review their various research and standardization projects under way and develop recommendations to be included in their reports presented at the annual meeting of the society. It is expected that the number of these committee meetings in Detroit will be in excess of a hundred and twenty-five.

THE thirty-third annual meeting of the American Home Economics Association will be held in Cleveland, Ohio, from June 23 to 27, under the presidency of Dr. Helen Judy Bond, head of the department of household arts and science of Teachers College, Columbia University.

THE suggestion has been made according to the *Journal* of the society that a section of the Mathematical Association of America should be organized in Central New York. A preliminary meeting will be held on Saturday, May 11, at Colgate University, Hamilton, which may result in the organization of such a section. The tentative plan for the meeting includes the presentation of papers, a discussion of the proposal for organizing a section with action upon the proposal and a dinner. Further information may be obtained from Professor C. W. Munshower, Colgate University, Hamilton, N. Y.

PLANS for the formation of a western organization of professional food technologists were taken up at a meeting held at the University of California by representatives of the food industries of the state. Speakers on the program, which was held under the auspices of the Fruit Products Laboratory of the College of Agriculture, included Ray Nagel, assistant director of the Western Regional Research Laboratory of the U. S. Department of Agriculture; A. J. Lorenz, of the California Fruit Growers' Exchange; J. R. Esty, director of the National Canners Research Laboratory; D. K. Grady, of the Rosenberg Brothers, and Otto Lang, of the Hooper Foundation for Medical Research at the university. The proposed western organization would be affiliated with the National Institute of Food Technologists. This institute was organized in 1939, following the second Food Technology Conference at the Massachusetts Institute of Technology. It is designed to bring together into one body the manufacturers, processors and distributors of food on a commercial scale and those persons engaged in research on problems of the food industries. Dr. W. V. Cruess, head of the Fruit Products Laboratory, and Dr. Karl F. Meyer, director of the Hooper Foundation, are both councilors of the institute.

THE Illinois Natural History Survey has acquired the Charles Robertson Collection of Insects, one of the largest collections in the state. It was purchased from Charles V. Robertson, son of the collector. The late Charles Robertson was for many years professor of botany at Blackburn College, Carlinville, Ill. Over 30,000 pinned insects comprise the collection, including over 200 type specimens. Bees and wasps make up about 20,000 of the collection. The Charles Robertson Collection of Insects was assembled over a period of thirty years. It was the result of a study by Professor Robertson on the interrelationships between insects and plants in pollination activities. The collection has been brought to Urbana and will be moved to the Natural Resources Building when it is completed.

DISCUSSION

COPYRIGHT

A BILL, S.3043, that proposes a complete revision of the copyright legislation of the United States is now before the Senate Committee on Patents. This bill was presented to Congress on January 8, 1940, at the request of the Committee for the Study of Copyright, which is a subcommittee of the National Committee of the United States of America on International Intellectual Cooperation, and which has the following members: Dr. Waldo G. Leland, American Council of Learned Societies; Professor James T. Shotwell, American member of the Committee on Intellectual Cooperation of the League of Nations; Professor Huger W. Jervey, Law School of Columbia University; Dr. Edith E. Ware is executive secretary.

Charged with the duty of proposing ways and means of improving our international relations in regard to copyright protection for the purpose of facilitating cultural interchange, the Committee for the Study of Copyright has studied Latin American laws and conventions; it recommended the protocol in Resolution XXXIX of the International Conference of American States at Lima, December, 1938, for amending the Buenos Aires Convention of 1910 for the Protection of Literary and Artistic Works. In 1938 and again in 1939, it sent a representative to the meetings of the Committee of Experts that was preparing the agenda of the Brussels Conference on the Revision of the Berne Convention (planned for 1940), who was able to explain the American position on a number of points. Meanwhile, the committee concluded that before the United States could become party, on an equal footing with other states, to any of these international conventions it would be necessary to revise its own law both in principle and in relation to modern methods of diffusion and of business practice.

This revision was undertaken with the cooperation of representatives of the major national associations that represent the creators and consumers of literary and artistic works. In round-table conferences, begun in the summer of 1938, the theory and practice of copyright protection was discussed. It was soon realized that, although international copyright protection had been the original object of the work of the Committee for the Study of Copyright, it was necessary to provide more adequate protection both for the author and for the consumer of literary and artistic works at home.

The basic principle for adequate protection for authors proved to be the same whether protection were desired nationally or internationally. Furthermore, it was found that trade practice here (although contrary to the letter of the present copyright law) and the legal practice in countries party to the Berne Convention coincided in regard to what is known as divisibility of copyright; that is, that the author may grant rights to use a work he has created in whole or in part, or for definitely specified times and places. It appeared desirable, therefore, to provide for this practice in our own law.

Another principle recognized by the more than forty countries of the world that have been members of the Berne Union for the Protection of Literary and Artistic Works is that authors have copyright in their works by virtue of having created them. International copyright relations built upon this principle have worked satisfactorily. American authors, who have all too frequently found themselves without copyright protection through the failure of agents, beyond their control, to fulfill all the formalities as required, have long been asking the same system of recognizing the rights of authors in the works they have created. Therefore, the basic principle of the new bill is that Congress grants to authors protection of their rights in their own works upon creation and without compliance with any conditions or formalities.

But since the right to use a work or any part thereof for profit is the control that is especially important in copyright, the new bill proposes that all grants of right to use a work or any part thereof shall be in writing and that such grants may be recorded in the Copyright Office, in much the same manner as transfers of land are recorded in a registry of deeds. Through careful provisions in this regard, the bill is designed to serve the interests of the consumer as well as those of the creator, for consumers in recent years have clamored increasingly for better protection through more adequate means of tracing title to the works or the rights in works they wish to use.

Deposit of copies in the Library of Congress is

retained, not as a condition of copyright but for the purpose of keeping a complete record of national literary and artistic achievement. The publisher, who must in any case furnish the Copyright Office with proper evidence that each publication was manufactured in the United Staes, is asked at the same time to deposit two copies with the Copyright Office. This arrangement is believed to incur no hardship upon anybody.

Statutory damages, much revised, are retained as a deterrent to infringement. This principle has been characteristic of every copyright law in the United States since 1790; in addition, however, the right to sue for statutory damages, under the provisions of the new bill, is dependent upon the fulfillment of all acts prescribed therein, or, to put it the other way, failure to fulfill the provisions of the bill automatically deprives the delinquent of his rights to statutory damages.

The bill that has been constructed upon these principles contains a number of new provisions: for example, it specifies among the non-infringing uses of copyrighted works the conditions under which libraries and individuals may use microcopy or other photographic process for the copying of manuscripts or of books no longer available for purchase. New techniques or new methods of diffusion are recognized and special provisions are made for non-infringing uses in relation to depicting or broadcasting public scenes or news events. The section on alien authors has been carefully rewritten, and includes extended jurisdiction of the presidential proclamation in international copyright matters. The manufacturing requirements for foreign English language works eliminate the old *ad interim* clause and set a generous importation quota for a trial sale edition. If the author or other owner imports more than the 500 printed copies permitted, in addition to the sales to libraries and certain other individual exceptions, the punishment is loss of protection for the right that has infringed the regulation; all other rights are retained.

Space prevents further summary of the content of S.3043. It is published in full in the *Congressional Record* of January 8, 1940, pages 134–49.

WALDO G. LELAND

AMERICAN COUNCIL OF LEARNED SOCIETIES

TYPES OF ANIMAL REFLEXES

THE usual type of reflex mechanism in animals consists of an afferent nerve path extending from a sense organ to some part of the central nervous apparatus whence an efferent nerve path leads to an outlying effector, commonly a muscle, gland or other like organ. This type of reflex mechanism, whose recognition dates from the days of Descartes, is well exemplified in the melanophore system of the catfish (Ameiurus) in which afferent nerve paths extend from the fish's eyes to its central nervous organs whence efferent nerve paths pass outward to the melanophores in its skin. This system is concerned with the reflex darkening of the fish which results from an expansion of its integumentary melanophores when, for instance, the fish is in a brightly illuminated, black-walled vessel.

Catfishes likewise become dark by means of a second system essentially independent of the one just described. When bright light falls on the skin of a catfish, it stimulates certain photoreceptors whereby impulses are generated that pass over the integumentary nerves to the central nervous organs where they reach the pituitary gland on the base of the brain. These impulses excite the discharge of one of the secretions of this gland, intermedin, which is then transported by the circulatory fluids of the fish, blood and lymph, from the place of origin to melanophores in the skin. Here the intermedin causes the melanophores to disperse their pigment and thus to darken the fish. This type of response is as truly reflex as the first one, but it differs from that one in having a humoral efferent arm in place of a nervous one. Its afferent arm, however, remains, as in the typical reflex, purely nervous. Such a reflex is thus easily distinguished by its humoral efferent component and may be designated in consequence of the sequence of its two components a neurohumoral reflex.

From the standpoint of humoral substitution a third type of reflex may be anticipated. In this the afferent arm would be humoral and the efferent nervous. As a matter of fact, such a reflex is to be seen in the respiratory organization of the higher vertebrates. Here the humoral afferent arm is represented by the stream of lymph and blood carrying carbon dioxide or other exciting metabolite from the animal's tissues to the respiratory center in its medulla oblongata. The nervous efferent arm in this reflex is the motor nerve connections between the medulla and the respiratory muscles. If the preceding example in consequence of the sequence of its components may be called neurohumoral this one for the same reason may be termed humeroneural. Thus, when neurohumors are taken into consideration, at least three types of animal reflexes can be distinguished, purely nervous, neurohumoral and humeroneural.

G. H. PARKER

HARVARD UNIVERSITY

NEW MATHEMATICAL LIBRARY OF INSTITUTE FOR ADVANCED STUDY

LAST fall the Institute for Advanced Study in Princeton, N. J., moved into a building of its own erected on its own grounds, called Fuld Hall. Up to

then the three departments (schools of mathematics, economics and politics and humanistic studies) had been scattered over the campus of the university and the town of Princeton.

The School of Mathematics of the Institute is devoted to research work in mathematics and theoretical physics. It consists of a permanent staff of six professors and one associate, their assistants and a varying number of temporary members, both from this country and abroad, some of whom receive stipends from the Institute.

The new building provides office space for the permanent and temporary members, room for the collections of the humanistic school and space for a research library. The School of Mathematics has started to build up its own library, which is intended to cover both mathematics and mathematical physics, and is prepared to buy second-hand books and sets of periodicals from private owners and duplicates from other libraries. Offers addressed to The Library, Institute for Advanced Study, Princeton, N. J., will receive careful consideration.

HERMANN WEYL
INSTITUTE FOR ADVANCED STUDY,
PRINCETON, NEW JERSEY

RECORD OF CHEMICAL PROGRESS

COPIES of the January, 1939, issue of the *Record of Chemical Progress* were sent to members of Section C of the A.A.A.S. because they contained preprints of the papers to be given at the Richmond meeting. There is an unusual demand for this issue; hence, any copies returned to the secretary will be deeply appreciated, and postage will be refunded.

NEIL E. GORDON
CENTRAL COLLEGE,
FAYETTE, MO.

SCIENTIFIC BOOKS

ENGLISH DIET

The Englishman's Food; A History of Five Centuries of English Diet. B. J. C. DRUMMOND and ANNE WILBRAHAM. 574 pp. with appendix. London: Jonathan Cape.

THIS book represents an attempt, according to the authors, "to present a picture of the changing character of the English diet during the past five centuries against a background of social and economic history." As such, it is unique among histories of nutrition. It is dedicated to William Stark (1740–1770), a martyr to the experimental study of foods, himself as subject (p. 286). It is of interest to American readers to learn that Stark "was diverted from anatomical studies with John Hunter to the study of the functions of foods as the result of a chance conversation with Benjamin Franklin, who at the time was in London on one of his political missions." This is but a sample of the wealth of interesting historical detail to be found in this book.

The outline of the book in 5 parts and 25 chapters is in the main chronological, but the historical journey is interrupted by pleasant interludes dealing with modern concepts of nutrition. For example, in discussing diet and health previous to the seventeenth century, it is noted that for the English peasant a great deal depended on the amount of "white meats," *i.e.*, milk, whey, cheese and eggs, which was eaten. Then follows an account of the recent experiments of Dr. Corry Mann on behalf of the Medical Research Council of Great Britain, showing the benefit of adding milk to the basic diet of a boys' institution, which provided rather small proportions of animal protein, fat and insufficient green vegetables. Further consequences of a diet lacking in dairy products in those times are discussed at this point in terms of vitamins.

Reviewing the seventeenth century writings of Burton ("Anatomy of Melancholy"), Samuel Pepys ("Diary"), John Evelyn ("Diary"), Thomas Muffet ("Health's Improvement"), Robert Boyle ("Medical Experiments") and others, the authors conclude that "all classes, rich and poor alike, were insufficiently protected against scurvy." An entire chapter (VII) is devoted to this disease at this point, particular attention being given to the origin of methods for its treatment. "All the evidence points to the English having learnt about scurvy from the Dutch sailors during the period of great voyages which started with Vasco de Gama's discovery of the West African Coast in 1498." Referring to the expedition of Jacques Cartier to the "backside of Newfoundland" in 1535 and the remarkable cure which he found for scurvy, the authors confute the opinion of Lind (1753) and others that it was a decoction of spruce tips which effected the cure, by recalling that Cartier's notes particularly refer to the fact that the "Indians had to wait for the leaves to appear in the spring." The tree, on the opinion of Dr. J. Gilmour, director of the Royal Botanic Gardens at Kew, was *Sassafras officinale.* The discussion of scurvy in this chapter and in Chapter XIV is the most enlightening historically known to the reviewer. The authors have brought to light many older writings bearing on the subject, ordinarily quite overlooked. Noteworthy is the little book entitled "Observationes circa Scorbutum," by Johannes Bachstrom, published at Leyden in 1743, which demolished all the complicated distinctions which had grown

up between "land scurvy" and "sea scurvy," and was perfectly definite about the primary cause, namely, a deficiency of fresh vegetables in the diet.

Rickets is dealt with in Chapters VIII (seventeenth century) and XV (eighteenth century). In the former there is not only a discussion of current theories regarding the control of bone and tooth formation, but the account of some interesting observations regarding the state of the Englishman's teeth, from skeletons collected in the vaults of St. Leonard's Church, Hythe, between the approximate dates 1250 and 1650. Approximately half the palates had lost no teeth at the time of death. It will be news to most physiologists to learn that demonstration of the way in which long bones grow and become calcified was first made on chicken bones by Stephen Hales, vicar of Teddington, whom they remember well as the first also to demonstrate the magnitude of arterial blood pressure (in the horse). A remarkable vicar! Rickets apparently was known in England as early as 1620, but became really serious only "with the rapid industrialization of the towns in the forties of the nineteenth century." Cod liver oil came into use in English clinical medicine in the eighteenth century. It formed a considerable article of merchandise thus early in the trade with Newfoundland. The first observation of benefit to "rheumatic" patients from oral administration of the oil was made at Manchester in 1782.

The book is replete with interesting facts, duly documented, regarding dietary practises from Tudor times down. We learn that at Tudor dinners fish usually came after meat, but this was reversed in the seventeenth century and the sequence soup, fish, meat established for all time. (Californians take note.) On the same page (131) with this information is the record of a wedding dinner for seven, which illustrates the preponderance of meat in the Englishman's diet in Stuart times. The cost of each item likewise is given. In the appendix the authors compute from many quantitative records of prescribed allowances for food, presented in the text, the probable composition of the daily dietary per man, inclusive of vitamins in international units. Some of the very old dietaries (fifteenth and sixteenth centuries) exceeded in food value some of the very modern ones, excepting only vitamins C and D.

The book might be criticized from the standpoint of constructional unity and logical sequence, but this would be academic. The authors have chosen the psychological order rather than logical and obviously have written not only for those versed in the science of nutrition but for the lay reader and the antiquarian as well as the medical profession. The reviewer ventures to predict, however, that the first-named group will read "The Englishman's Food" with the greatest relish. Certainly every teacher of nutrition should read it.

JOHN R. MURLIN
UNIVERSITY OF ROCHESTER

ANTONI VAN LEEUWENHOEK

The Collected Letters of Antoni van Leeuwenhoek. Edited, illustrated and annotated by a committee of Dutch scientists. Part I. 1673–1676. 454 pp., 39 plates, portrait. Amsterdam: Swets and Zeitlinger, Ltd., 1939. 4to, cloth, $12.25 (about); ltd. edition, $27.50 (about).

LEEUWENHOEK'S extensive publications are all excessively rare works in Latin or Dutch, except those in the *Philosophical Transactions* of the Royal Society of London in 1673–1724. Dr. Clifford Dobell's "Antoni van Leeuwenhoek and His Little Animals" has made available an account of this early microscopist and his work, but what he actually wrote and sketched has been inaccessible to the many microscopists, botanists, zoologists, bacteriologists, histologists, physiologists, chemists, crystallographers and physicians who are interested in some or many of his discoveries.

His writings are now to be made accessible in a series of about 20 quarto volumes, edited, illustrated and annotated by a committee of Dutch scientists and printed on facing pages in Dutch and English. The quality of the work and the success of the enterprise are ensured by the sponsorship of the Royal Dutch Academy of Sciences, whose Mathematical and Physical Section finances the project, and the Dutch Society of Physicians, publishers of *Het Nederlandsch Tijdschrift voor Geneeskunde,* in whose office the work is prepared by a large committee of representative Dutch scientists under the editorship of Professor G. C. Heringa, professor of histology in the University of Amsterdam.

The efforts of the committee have succeeded beyond expectation in locating the original "letters" of Leeuwenhoek and his correspondence with Huygens, Leibnitz and Magliabechi. It has been discovered that the letters published by the Royal Society were not always complete or correct. This edition will therefore publish the letters in full in Leeuwenhoek's own language and parallel them in a correct English translation. The illustrations will be made whenever possible from Leeuwenhoek's own original sketches in red chalk.

Supplementing these factual originals there will be interpretive comment clarifying Leeuwenhoek's obscure and tangled sentences and modern illustrations of objects he discovered prepared by competent specialists. By these scholarly aids the modern reader can arrive at a more complete understanding of the nature and extent of Leeuwenhoek's observations. Furthermore, some of Leeuwenhoek's seemingly child-

ish comments are to be elucidated in the light of philosophic systems and physical doctrines of his own day.

In order that the true extent of Leeuwenhoek's discoveries may be appreciated competent specialists will add critical notes on contemporary writings and backgrounds in scientific, historical and cultural fields. Thus Leeuwenhoek and his contradictors will be seen in the frame of their own day and society. Each volume will have a list of illustrations, indices of objects investigated and persons named by Leeuwenhoek or referred to by the commentators and annotators and a bibliography of all pertinent books and writings. Portraits of Leeuwenhoek and of persons concerned with his writings and a reproduction of a page of his manuscript will also be included. The concluding volume will contain a life of Leeuwenhoek and critical estimates of his achievements in various fields.

Volume I of the series contains his letters, 1 to 21 inclusive, written in the years 1673–1676 with details of his discoveries on a great assortment of objects ranging from a body louse to tobacco smoke on glass, from human red blood cells to a cat's whiskers and a crystal of rock salt to the smoke of arsenic. The biographical register has brief lives of 53 contemporaries and predecessors from Archimedes to Vesalius. The illustrations fill 39 plates. Their adequacy appears in the fact that Leeuwenhoek's figure of the body louse is supplemented by that of Redi (1671) and Hooke (1665). The frontispiece is the portrait of Leeuwenhoek from the painting by Johannes Verkolje dated 1686, in the Royal Museum of Amsterdam. There is also a portrait of Regnier de Graaf after Watelet and a series of figures of Leeuwenhoek's microscopes.

This is an indispensable work for every scientific library and a great addition to the literature of the history of science. The whole enterprise is a splendid example of cooperative effort in the field of the history of science, demonstrating the critical and permanent values and the stimulus to scholarly effort arising from such an enterprise.

CHARLES A. KOFOID
UNIVERSITY OF CALIFORNIA

REPORTS

MEMBERSHIP OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The American Association for the Advancement of Science was organized in 1848 with an initial membership of 461, and its first meeting was held in Philadelphia on September 20. Although the association is now nearly 100 years old, there are two other American scientific societies which were organized much earlier, the American Philosophical Society Held at Philadelphia for Promoting Useful Knowledge (to give it its full name) and the American Academy of Arts and Sciences, of Boston, Mass. The American Philosophical Society, which was incorporated on March 15, 1780, grew out of Benjamin Franklin's club, called the Junto, which was started in 1727. The American Academy of Arts and Sciences was granted a charter from the Commonwealth of Massachusetts on May 4, 1780.

For the first 50 years after its organization the membership of the association grew slowly, the number of members by decades until 1898 being as follows:

Year	Membership	Meeting Place
1848	461	Philadelphia
1858	962	Baltimore
1868	686	Chicago
1878	962	St. Louis
1888	1,964	Cleveland
1898	1,729	Boston

A new period in the history of the association began in 1900 when *Science* became its official journal and was sent to all its members. Under the direction of Dr. J. McKeen Cattell and other able men who clearly saw that the association might be made a powerful agency in advancing American science, its membership doubled within two years and grew steadily until the close of the World War. During the decade 1920–1930 the association made its greatest growth, partly because of the impetus given to science by the war, partly because of the rising tide of prosperity in the country and especially because the council elected Dr. Burton E. Livingston permanent secretary of the association. The membership by five-year intervals from 1900 to 1930 as of September 30 was as follows:

Year	Membership	Meeting Place
1900	1,925	New York
1905	4,041	Philadelphia
1910	7,950	Boston
1915	8,325	Philadelphia
1920	11,442	St. Louis
1925	14,263	Washington
1930	19,059	Cleveland

During the decade from 1930 to 1939, inclusive, the association suffered from the effects of the depression and the recession. Yet in spite of serious losses in membership in 1932, 1933 and 1935, its membership is now greater than at any previous time. Details of membership data for the decade are given in Table 1.

Present trends in the membership of the association are indicated in the averages for the years 1937–1939. Since the gross loss in membership averages about 1,185 per year, the total membership of the association will decrease unless on the average about 1,185 persons become members each year. Although the gross loss in members may at first appear to be large, it is less than 6.2 per cent. of the total membership. Of the average of 1,185 persons who ceased to be members,

TABLE 1

Year	Membership	New members	Deaths, resignations, etc.	Net change
1930 ...	19,059	1,507	910	+ 597
1931 ...	19,889	1,977	1,147	+ 830
1932 ...	19,665	1,397	1,621	− 224
1933 ...	18,549	833	1,939	−1,116
1934 ...	18,553	2,029	2,025	+ 4
1935 ...	17,937	1,171	1,787	− 616
1936 ...	18,242	1,513	1,208	+ 305
1937 ...	18,303	1,142	1,081	+ 61
1938 ...	19,347	2,156	1,112	+1,044
1939 ...	20,195	2,210	1,362	+ 848
Average ..	18,974	1,594	1,419	173
Average '37–'39 .	19,282	1,836	1,185	651

218 died, 452 resigned and 515 failed to pay their dues. Of those who resigned, a large fraction gave retirement or lack of funds as their reason for resigning. The same reason probably applies to an appreciable fraction of those who simply neglected to pay their membership dues without giving their reasons. Finally, there are members who do not find their membership in the association worth what it costs them (1.4 cents per day) and who do not wish to make a contribution to the association.

One can not read the letters of retired scientists, expressing their deep regret at being compelled to discontinue their membership in the association, without wishing that the association had an endowment sufficient to provide their membership dues upon their retirement from active work, provided they had attained the age of 65 years and had been members of the association for 15 consecutive years (other time limits, of course, might be set). The questionnaire sent out for information desired for the new directory of members of the association will make it possible to determine how much endowment would be required for this purpose.

The resignations and failures to pay dues because members do not feel that their memberships are worth what they cost may be taken as reflections upon the association, although it can not be expected that any organization can satisfy every person. Instead of hiding behind this excuse, the officers of the association should ceaselessly continue to seek and to put into effect ways of improving its service to its members and to science. It has been with this purpose in mind that the association has undertaken to publish the most important symposia presented at its meetings. They are proving to be very gratifying successes. It is also with this purpose in mind that the association has made arrangements for the publication of non-technical books on science and for making them available to its members at substantial discounts. However, in spite of the limited funds of the association available for operations, these services to its members by no means exhaust the possibilities.

The tables that have been given show a very rapid increase in membership of the association during the decade 1920–1929, a substantial decline during the worst years of the depression and a substantial increase during the past three years. What the future of the membership will be is of course uncertain. Many factors enter into the question. One is the number of scientists in the United States and Canada. In the latest edition of "American Men of Science" the names of about 28,000 scientists are listed; there are probably 100,000 persons engaged in scientific work in this country. Probably a much larger fraction of them would become members of the association if it would serve them better. Since the meetings of the association are now so large as to tax the facilities of even the large cities, it can not be expected that any large percentage of its members can attend its meetings. They must be served otherwise—by its journals, symposia, books, branches, lectures, etc.

There are in addition what may be called lay members of the association, those not engaged professionally in scientific research but who have an interest in science as perhaps the greatest force affecting civilization to-day. The number of such persons is very large, at least a million, and they are being constantly added to by those who graduate from our universities. With a million students in the universities and at least one fifth of them taking their major sequence in some science, the additions to those who are interested in science are very great. Now what can the association do for such persons? There are three obvious things: make *The Scientific Monthly* a journal of the greatest attractiveness and distinction, arrange for the publication of non-technical books on science, and make available a list of persons who can and will deliver popular lectures on scientific subjects that will carry to lay audiences the adventure, the wonders, the importance and the intellectual honesty of science.

A large membership of the association will be of importance for two reasons. First, it will make *The Scientific Monthly* profitable and therefore enable the association to do many things it can not do now because of lack of funds. It will have the much more important effect of helping to maintain in this country a large middle class, intellectually speaking, because basically it is on this class that the future of science and liberty depend. History shows that civilizations have failed only after their middle classes have been liquidated, to use a term that unfortunately is being heard with increasing frequency. No other class than those who have caught the visions of science while keeping contacts with the everyday world will carry more ballast in time of storm. With liberties failing and civilizations threatening to crumble these are not idle words.

F. R. MOULTON,
Permanent Secretary

SPECIAL ARTICLES

HISTAMINE RELEASE FROM BLOOD CELLS IN ANAPHYLAXIS IN VITRO[1]

It is a well-established fact that in anaphylaxis tissues from some species of animals release a substance with all the known biological and, as far as examined, chemical properties of histamine. This substance, subsequently referred to as histamine, is released in anaphylactic shock *in vitro*[2] and *in vivo*,[3] and many investigators have shown that anaphylactic reactions such as the smooth muscle contraction accompanied by the histamine release take place in isolated organs without the presence of blood. Such observations necessarily led to a revision of the earlier assumption that the blood is the site of antigen-antibody union and formation of an "anaphylatoxin" (histamine), and to-day it is accepted that these reactions take place in the cells. The shift of emphasis from the body fluids to tissues as the site of antigen-antibody union and subsequent histamine release has perhaps detracted from the possibility that blood—as a suspension of cells—may also release histamine in anaphylactic shock. The following is a brief report on investigations in this direction.

Rabbits were sensitized by several intravenous injections of egg albumin (Merck). From 10 to 30 days after the last injection, blood was taken by heart puncture, heparinized, and divided into two samples. To one sample egg albumin, which had previously been dissolved in a small amount of Locke's solution, was added, so as to make it 1:1000 egg albumin in blood. The other sample served as an untreated control. Both samples were incubated at 37° C. for 10 minutes. The plasmas were next separated by rapid centrifugation, filtered, and their histamine extracted according to Code's modification of Barsoum and Gaddum's method.[4] (At the beginning of the extraction process, a corresponding amount of egg albumin was added to the control sample in order to exclude the possibility that this substance by itself might be the source of any increased histamine content in the "shock" blood.) The assay was carried out on the isolated atropinized guinea pig ileum. In all instances in which "sensitized" blood had thus undergone "shock" *in vitro*, its plasma contained a higher histamine level than the control samples which had not been incubated with antigen. The differences ranged from 100 to 600 per cent. in rabbits, and were also very distinct but somewhat smaller in a few experiments on sensitized dogs and guinea pigs. No differences in plasma histamine were found when blood from unsensitized animals was incubated with egg albumin and compared with untreated samples, or when cell-free plasmas from sensitized animals were incubated with antigen and compared with controls.

From these studies, it may be concluded that blood cells from sensitized animals release histamine into the plasma when they are in contact with the antigen. Which cells are concerned with this shock reaction is the subject of investigations which are in progress. In the animal species examined, the quantities of histamine thus set free by blood in shock *in vivo*, as estimated from the *in vitro* experiments are of an order sufficient to be physiologically active and would be large enough to play a definite role in anaphylactic shock.

The results so far obtained also suggest the possibility of following anaphylaxis in one and the same animal. This would not involve disturbing the sensitization of the animal as when shock *in vivo* is produced, or sacrificing the animal as is necessary for the Schultz-Dale experiment on isolated smooth musculature. An extension of these studies to cases of human allergy is planned.

Gerhard Katz

Department of Pharmacology,
Tulane University

[1] Aided by a grant from the John and Mary R. Markle Foundation.

[2] R. Bartosch, W. Feldberg and E. Nagel, *Pflügers Arch.*, 230:129, 674, 1932.

[3] C. F. Code, *Amer. Jour. Phys.*, 127: 78, 1939.

[4] C. F. Code, *Jour. Phys.*, 89: 257, 1937.

POTASSIUM DEFICIENCY IN AMMONIUM- AND NITRATE-FED TOMATO PLANTS

Symptoms of potassium deficiency in tomato plants grown with nitrate nitrogen have been observed by numerous investigators and are generally known.[1] Substituting ammonium nitrogen for nitrate nitrogen produces entirely different symptoms.

Four groups of seedling tomato plants were established in white quartz sand and were supplied with the following solutions: (1) complete nutrients with nitrate nitrogen; (2) complete nutrients with ammonium nitrogen; (3) lacking potassium with nitrate nitrogen; (4) lacking potassium with ammonium nitrogen. The solutions were supplied to the plants at pH values previously recommended.[2]

The plants supplied with the two complete nutrient treatments made a luxuriant growth for the duration of the experiment. After three weeks the plants supplied with a minus potassium-nitrate solution exhibited early deficiency symptoms[1] (stunted growth, foliage containing abundant starch, pin-point necrotic areas appearing on the curled margins of the older leaves).

The plants supplied with a minus potassium-ammonium nitrogen solution exhibited symptoms on the seventh day, but very different from the nitrate

[1] M. E. Wall, *Soil Science*, 47: 143–161, 1939.

[2] V. A. Tiedjens, *Plant Physiology*, 9: 31–57, 1934.

plants. The foliage was darker green. The plants were stunted and contained considerable starch. This starch, however, rapidly disappeared after four days. The leaves wilted and died in twenty-four hours after the appearance of the first symptoms without changing color, or exhibiting any of the symptoms associated with the nitrate-supplied plants.

Data from the analysis of the four groups of plants showing the ammonium nitrogen in the leaves and stems are graphically shown in Fig. 1.

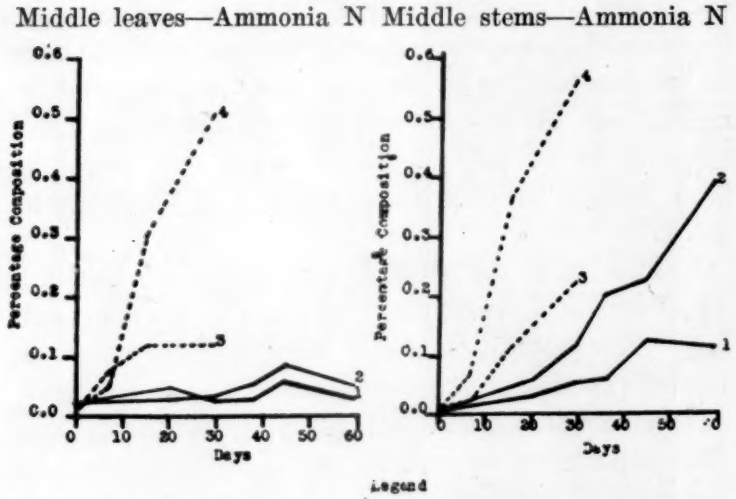

FIG. 1. Nitrogenous fractions of Rutgers tomato plants receiving nitrate and ammonium nitrogen and plus-potassium and minus-potassium nutrient solutions.

The comparatively high concentration of ammonium nitrogen in those plants supplied with ammonium, but no potassium, apparently was responsible for the rapid deterioration and collapse of the leaf tissue. Carbohydrates likewise decreased very rapidly as ammonium increased in the foliage. However, the cause of the injury must be attributed to the lack of potassium in preventing ammonium from being converted to amino and protein nitrogen. The chemical reactions involved in the metabolic cycles of potassium-deficient plants supplied with nitrate or ammonium nitrogen differ only in the fact that the ammonium plants have at hand a large supply of readily assimilated nitrogen. The nitrate plants, on the other hand, must first form ammonia through the reduction of nitrates. These facts account for the rapid completion of the cycle of chemical reactions in the potassium deficient plants supplied with ammonium, requiring less than two weeks to bring them about, while it required three to eight weeks for similar processes to take place in the plants supplied with nitrate. This is probably responsible for the two different types of deficiency symptoms observed.

M. E. WALL
V. A. TIEDJENS

NEW JERSEY AGRICULTURAL EXPERIMENT STATION

POLYPLOIDY IN SOYBEAN, PEA, WHEAT AND RICE, INDUCED BY COLCHICINE TREATMENT

WHEN day-old seedlings of soybean, pea and wheat (*Mei-Yü* variety) and 2-day-old seedlings of paddy rice (*Mar-Tze-Tao* variety) were soaked in 0.05-0.1 per cent. solutions of colchicine for 24 or 48 hours under ordinary conditions of temperature and light the plants that developed were found to be tetraploid as shown by microscopic examination of their root-tips. Compared with normal plants, those from treated seedlings generally had thicker and rougher leaves, larger cells, larger nuclei and larger stomata. In plants grown from seedlings that had received the 24-hour treatment both shoots and roots were notably more sturdy than those of the controls. When soybean seeds were placed in 0.05 per cent. colchicine solution and allowed to germinate there, the resulting plants showed these same peculiarities. When seedlings of soybean and pea were immersed in 0.05 per cent. colchicine solution for 24 hours in darkness, their leaves soon died but new leaves were formed after a week or two. When a film of lanoline containing 1 per cent. of colchicine was applied to shoot tips of soybean and pea seedlings, or when 4–6 drops of 0.05 per cent. colchicine solution was applied in the same way, treatment resulted in shortening of internodes and curling of leaves.

P. S. TANG
W. S. LOO

INSTITUTE OF AGRICULTURAL RESEARCH,
NATIONAL TSING HUA UNIVERSITY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A MODIFIED KENDALL TUBE FOR PURIFYING NITROGEN[1]

KENDALL[2] has described a method of purifying nitrogen in a glass tube containing a double roll of copper gauze, heated by radiation from a nichrome coil at the center of the tube. Oxygen is removed by direct combination with the heated copper gauze which slowly becomes tarnished. The tarnished gauze is restored to bright copper by slow flushing of the tube with hydrogen, and can be so used indefinitely.

In our studies of bacterial enzymes, we have

[1] This work has been aided by the Graduate Medical Research Fund of the University of Minnesota.

[2] E. C. Kendall, SCIENCE, 73: 394, 1931.

uch a Kendall tube for the production of oxygen-free itrogen from regular tank nitrogen of reputed 99.44 er cent. purity. Our experience with this original esign is quantitatively summarized in Fig. 1, where

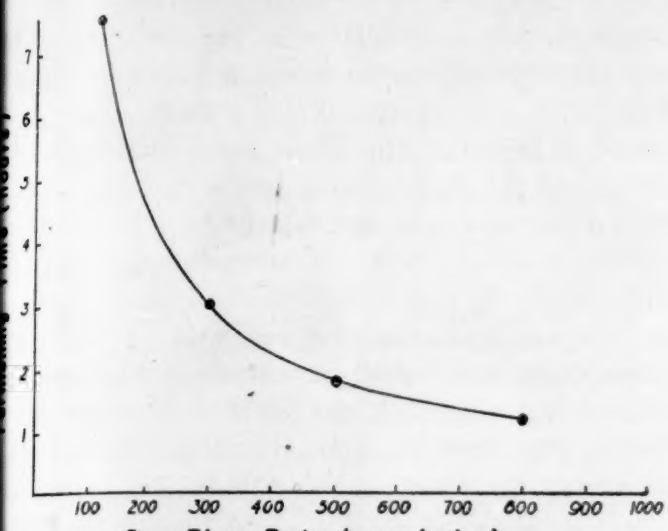

FIG. 1

e time at which tarnishing of all the gauze is comete is plotted against corresponding rates of gas w.

It is the purpose of this paper to describe a slight odification in design of tube, providing for increased pacity. Both the original design and the new sign are shown in cross section in Fig. 2.

FIG. 2

f a Calrod[3] heating element is used as a source of t, the copper gauze may be tightly wrapped und the heating element to a thickness just below inside diameter of the glass case. The heating ment which we find satisfactory draws 500 watts at volts, is 23¾ in. in length, and has 17-inch effective ting surface. One-inch asbestos tape is wrapped tly about the copper gauze bundle at several nts about four inches apart to provide a snug fit the bundle in the glass case, and to prevent chaning of the gas through the tube. It is essential this asbestos packing be very tight. Care should aken that the materials entering the tube do not me greasy from handling, as this grease will dis- off the materials on heating, and condense on the de of the tube.

Manufactured by General Electric Company.

The new design has two advantages over the original. (1) The capacity for oxygen removal is considerably increased, the new having 10 to 12 times the capacity of the original. (2) Provision is made for more intimate contact between gases and the hot gauze. If the Reynolds number[4] is calculated for gas flow in the original tube according to the equation, $\text{Reynolds number} = \frac{D u \rho}{\mu}$, it is found that at a gas flow of 100 cc/min, the Reynolds number is 1.5. Since u, the velocity of flow, is directly proportional to the Reynolds number, this number for any flow velocity can easily be computed from this one calculation; *e.g.,* at 1,000 cc/min, the Reynolds number is 15. When the Reynolds number is less than 2,100, viscous flow obtains. Therefore flow in the original tube is of the viscous type whenever the gas flow rate is below 100,000 cc per minute. It may be possible, therefore, for oxygen molecules to pass from one end of the tube to the other through the open central portion of the tube without coming into contact with the hot copper. Removal of oxygen should therefore be more complete with the new design. This point must be settled, however, by further experimental work. At the same time, gas flow is unrestricted. Calculations of Reynolds numbers for the new design would be without meaning, since the circuitous path imposed upon the gas insures turbulent flow.

Our tube was constructed by the Central Shops of the University of Minnesota.

G. M. SAVAGE
Z. JOHN ORDAL

UNIVERSITY OF MINNESOTA

COLD EXTRACTION APPARATUS

OFTENTIMES one wishes to extract a solute from solution without the use of heat. In biological chemistry, especially, there are many substances which are easily destroyed by boiling solvents.

The author has designed and built a special cold extraction apparatus which is schematically shown in Fig. 1. The apparatus works on the principle that two immiscible liquids, such as water and benzene, for example, will not mix, but will rise and separate on the top of the heavier one similar to oil on water. The long column A is half filled with the aqueous solution to be extracted. Benzene or any other immiscible liquid which is lighter than water is allowed to run down the inner tube C, passing through a porous glass filter at the bottom. The latter disperses the organic solvent into many small bubbles which extract as they rise through the water and separate at the top. The upper liquid containing the extracted

[4] Badger and McCabe, "Elements of Chemical Engineering." Second Edition. McGraw-Hill Book Company, 1936.

substances flows off into the syphon chamber and eventually into the reservoir. In so doing the organic liquid flows up the tube D due to suction created by the liquid sealing the end of same tube. The liquid flows up to the suction chamber on top to a level of about half. The weight of the liquid delivered in suction chamber trips the balance arm above and thus allows the left-hand side to be lowered a few inches and the right side to be raised by the same amount. This latter side is fastened to a wire E, which is connected to tube D. This above action lifts the tube D up out of the liquid, breaking the seal and allowing air up the same tube and releasing the suction in the suction chamber above. By releasing the suction on the system, the float valve rises and allows the liquid to flow out into storage chamber F. From here it flows down at a speed governed by means of flow control valve through the inner tube G through a porous glass filter into another aqueous solution, which reextracts the dissolved solute back into the aqueous phase again. The organic liquid rises in many small bubbles, separates at the interface and flows over to storage chamber H. From here the whole process repeats itself, going on continuously.

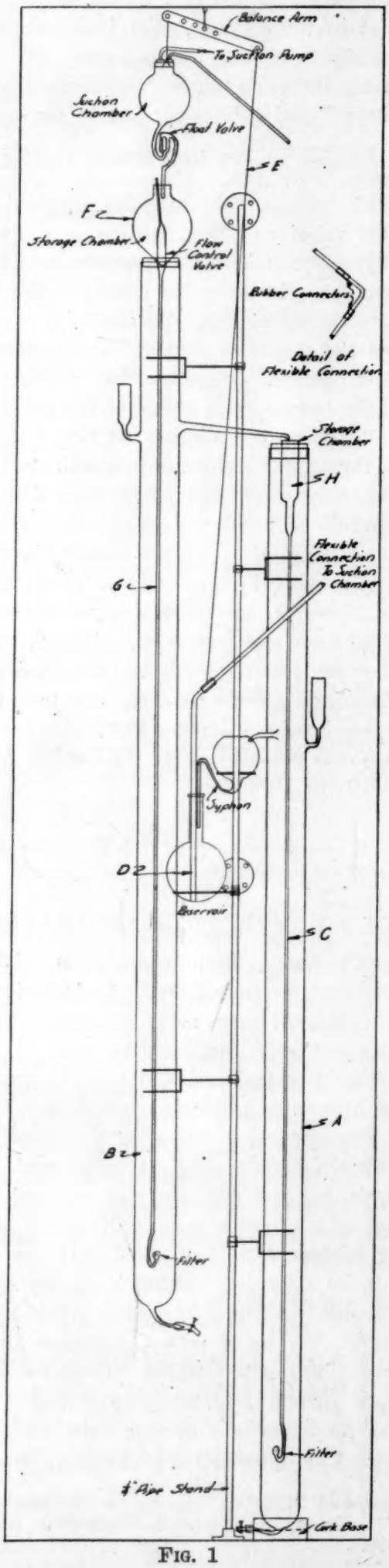

FIG. 1

The apparatus could be built of any desired size, and it may be used for a variety of problems by simply using different solvents.

The writer is greatly indebted to Dr. S. J. Thannhauser, whose laboratory supported the building of the above apparatus, and also to E. Perkins, who helped overcome one of the mechanical difficulties. The glass blowing was done by J. Rossetti.

JOSEPH BENOTTI

THANNHAUSER LABORATORY,
BOSTON DISPENSARY, BOSTON

BOOKS RECEIVED

ARCHBOLD, RICHARD and A. L. RAND. *New Guinea Expedition, Fly River Area, 1936–1937.* Pp. xviii + 20[illegible] Illustrated. McBride. $3.50.

ATWOOD, WALLACE W. *The Physiographic Provinces of North America.* Pp. xvi + 536. 281 figures. Ginn. $4.80.

BURLINGAME, L. L. *Heredity and Social Problems.* Pp. xi + 369. 77 figures. McGraw-Hill. $3.50.

Cambridge Physical Tracts: H. J. J. BRADDICK, *Cosmic Rays and Mesotrons.* Pp. ix + 68. Illustrated. $1.50. J. K. ROBERTS, *Some Problems in Adsorption.* Pp. 1[illegible] 120. 33 figures. $2.00. Cambridge University Press. Macmillan.

FOWLER, R. H. and E. A. GUGGENHEIM. *Statistical Thermodynamics.* Pp. x + 693. Illustrated. Cambridge University Press, Macmillan. $9.50.

HERSKOVITZ, MELVILLE J. *The Economic Life of Primitive Peoples.* Pp. xii + 492 + xxviii. Knopf. $4.50.

LINDSAY, ROBERT B. *General Physics for Students of Science.* Pp. xiv + 534. Illustrated. Wiley. $3.[illegible]

RICE, OSCAR K. *Electronic Structure and Chemical Binding* (with Special Reference to Inorganic Chemistry). Pp. xiv + 511. 91 figures. McGraw-Hill. $5.00.

SMITH, B. WEBSTER. *The World Under the Sea.* Pp. vii + 230. Illustrated. Appleton-Century. $3.00.

Tôhoku Imperial University; Science Reports. First Series. (Mathematics, Physics, Chemistry.) October 1939. Pp. 260. Illustrated. Maruzen. Tokyo.